

Partial English Translation relevant to Example 11 in Japanese  
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Title of the invention: TONER FOR ELECTROPHOTOGRAPHY

Applicant: Ricoh Company, Ltd.

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Hereinafter, the present invention will be more specifically explained, referring to examples. Each example is just one of embodiments of the present invention, and the present invention is not limited thereto. Parts in the examples represent parts by weight.

Mother Toner Production Example 1

The following materials were mixed by Henschel mixer, and kneaded upon application of heat by a biaxial extruder at 130 °C.

Polyester resin	100 parts
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(a condensate between an adduct of bisphenol A with ethyleneoxide and a terephthalic acid)

Colorant	4 parts
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(Quinacridone magenta pigment)

Charge controlling agent	2 parts
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(zinc salycilate)

Next, the kneaded material was cooled and pulverized by a jet stream pulverizer, and then the pulverized material was

classified by a wind power classifier to prepare a magenta mother toner a having a number-average particle diameter of 5.7  $\mu\text{m}$ , a volume-average particle diameter of 11.0  $\mu\text{m}$  and a ratio of the volume-average particle diameter to the number-average particle diameter of 1.9.

#### Mother Toner Production Example 3

The procedures for preparation of the magenta mother toner in Mother Toner Production Example 1 were repeated except for changing the pulverizing and classifying conditions to prepare a magenta mother toner c having a number-average particle diameter of 7.3  $\mu\text{m}$ , a volume-average particle diameter of 11.0  $\mu\text{m}$  and a ratio of the volume-average particle diameter to the number-average particle diameter of 1.5.

#### Example 1

3 parts by weight of silica AEROSIL TT600<sup>®</sup> from Nippon Aerosil Co., Ltd. having an average primary particle diameter of 0.04  $\mu\text{m}$  and 0.2 parts by weight of titania CR-EL<sup>®</sup> from ISHIHARA SANGYO KAISHA, LTD. having an average primary particle diameter of 0.3  $\mu\text{m}$  and 100 parts of the mother toner a prepared in Mother Toner Production Example 1 were fully mixed by the Henschel mixer from MITSUI MIIKE MACHINERY Co., Ltd. to prepare a toner for electrophotography.

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**Example 11**

The procedures for preparation of the toner for electrophotography in Example 1 were repeated except for using the mother toner c prepared in Mother Toner Production Example 3 instead of the mother toner a prepared in Mother Toner Production Example 1 to prepare a toner for electrophotography as shown in Table 1.

Table 1

	MT	Si			Ti			Si:Ti	TTL AMT of Si & Ti
		ST (AMT)	APPD ( $\mu$ m)	AMT	ST (AMT)	APPD ( $\mu$ m)	AMT		
Ex. 1	a	N11	0.04	3.0	N11	0.3	0.2	15:1	3.2
Ex. 11	c	N11	0.04	3.0	N11	0.3	0.2	15:1	3.2

Si: silicon

Ti: Titanium

MT: Mother toner

ST: Surface treatment

AMT: Amount

APPD: Average primary particle diameter

TTL: Total

A segregation rate of Si atom or Ti atom of each of the toners prepared in Examples 1 and 11 was measured by PT1000<sup>®</sup> from Yokogawa Electric Corp. with the measurement conditions and formula as previously mentioned. The results are shown

in Table 2.

While 5 kg of Cu-Zn ferrite having a particle diameter of 45  $\mu\text{m}$  were fluidized in a fluidized-bed coater, a solution including 500 g of silicone resin liquid SR2411<sup>®</sup> having a solid content of 20 % by weight from Dow Corning Toray Silicone Co., Ltd. and 1,450 g of toluene was sprayed onto the Cu-Zn ferrite at 80 °C. Further, the coated Cu-Zn ferrite was fired at 210 °C for 2 hrs to prepare a carrier coated with the silicone resin.

5 parts of each toner prepared in Examples 1 and 11 and 95 parts of the carrier were mixed by Turbula Shaker Mixer for 10 min to prepare a two-component developer.

The following evaluations were made on the toners prepared in Examples 1 and 11 and the two-component developer including the toners.

#### 1. Solid image

Ten solid images were produced to count white spots thereon to determine an average number of the white spots per an image. Then, the image was ranked to have one of five grades. The larger the grade, the better the image. The results are shown in Table 2.

#### 2. Fluidity

Sieves having an opening of 150, 75 and 45  $\mu\text{m}$  are located in this order from above on a powder tester from HOSOKAWA MICRON CORP. 2 g of the toner was put on the sieve having an opening of 150  $\mu\text{m}$  and vibrated at an amplitude of 1 mm for 30 sec.

A weight of each toner on the sieves was measured. Then, each weight was multiplied by 0.5, 0.3 and 0.1 respectively, and the respective multiplied values were added together and the added value was represented in percentage. The smaller the (aggregation) value, the better the fluidity of the toner. The results are shown in Table 2.

### 3. Durability

400 g of each of the above-mentioned developers were set in an electrophotographic copier PRETER550® from Ricoh Company, Ltd. Image density in a part of an initial image and image density in the same part of an image after ten thousand images were continuously produced were measured by Rite 938. The smaller the difference of the image density, the better the durability of the toner. The results are shown in Table 2.

Table 2

	S1 Segre- gation rate (%)	T1 Segre- gation rate (%)	Color solid image	Fluidity aggrega- tion (%)	Image density		
					initial	after 10,000	difference
Ex. 1	7	12	3	9.1	1.77	1.60	0.17
Ex. 11	1	5	5	8.8	1.76	1.69	0.07